

## Contributors to This Issue

W. L. BOND, B.S. 1927 and M.S. 1928, Washington State College; Bell Telephone Laboratories, 1928-. Mr. Bond has conducted investigations in the mineral field including studies of the piezoelectric effect in minerals and similar studies of synthetic crystals. He has designed optical, X-ray, and mechanical tools and instruments for the orientation, cutting and processing of crystals. Mr. Bond also served as consultant on quartz crystals with the War Production Board. He is a member of the American Physical Society, and of the American Crystallographic Association.

WALTER H. BRATTAIN, B.S., Whitman College, 1924; M.A., University of Oregon, 1926; Ph.D., University of Minnesota, 1929. Honorary D.Sc. Portland University, 1952, Whitman College and Union College, 1955. Radio section, Bureau of Standards, 1928-29. Bell Telephone Laboratories, 1929-. Co-inventor with Dr. John Bardeen of point contact transistor. Primary activity at Laboratories in semi-conductors. Research in field of thermionics, particularly electronic emission from hot surfaces. Frequency standards, magnetometers and infra-red phenomena. Studied magnetic detection of submarines for National Defense Research Committee at Columbia University, 1942-43. Visiting lecturer at Harvard University, 1952-53. Author of numerous technical articles. Recipient of John Scott Medal, 1955, and Stuart Ballantine Medal of Franklin Institute, 1952. Fellow of American Physical Society, American Academy of Arts and Sciences and American Association for the Advancement of Science. Member of Franklin Institute, Phi Beta Kappa and Sigma Xi.

C. C. COLE, B.S. in E.E., State College of Washington, 1923; U. S. Navy 1917-1919; Western Electric Company 1923-. His first assignment was in manufacturing development on paper and mica capacitors. Other assignments include manufacturing development on loading coils, quality control, and inspection development laboratory. During World War II he handled the design and construction of testing facilities for various defense projects. Since World War II he has been engaged in

inspection methods development and in the development and design of testing facilities for telephone apparatus and cable. Member of Sigma Tau and A.I.E.E.

ARTHUR B. CRAWFORD, B.S.E.E. 1928, Ohio State University; Bell Telephone Laboratories, 1928-. Mr. Crawford has been engaged in radio research since he joined the Laboratories. He has worked on ultra short wave apparatus, measuring techniques and propagation; microwave apparatus, measuring techniques and radar, and microwave propagation studies and microwave antenna research. He is author or co-author of articles which appeared in *The Bell System Technical Journal*, *Proceedings of the I.R.E.*, *Nature*, and the *Bulletin of the American Meteorological Society*. He is a Fellow of the I.R.E. and a member of Sigma Xi, Tau Beta Pi, Eta Kappa Nu, and Pi Mu Epsilon.

HARALD T. FRIIS, E.E., 1916, D.Sc., 1938, Royal Technical College (Copenhagen); Engineering Department of the Western Electric Company, 1919-1924. Bell Telephone Laboratories, 1925-. Dr. Friis, Director of Research in High Frequency and Electronics, has made important contributions on ship-to-shore radio reception, short-wave studies, radio transmission (including methods of measuring signals and noise), a receiving system for reducing selective fading and noise interference, microwave receivers and measuring equipment, and radar equipment. He has published numerous technical papers and is co-author of a book on the theory and practice of antennas. The I.R.E.'s Morris Liehmann Memorial Prize, 1939, and Medal of Honor, 1954. Valdemar Poulson Gold Medal by Danish Academy of Technical Sciences, 1954. Danish "Knight of the Order of Dannebrog," 1954. Fellow of I.R.E. and A.I.E.E. Member of American Association for the Advancement of Science, Danish Engineering Society and Danish Academy of Technical Sciences. Served on Panel for Basic Research of Research and Development Board, 1947-49, and Scientific Advisory Board of Army Air Force, 1946-47.

C. C. B. CARRETT, B.A., Cambridge University (Trinity College), 1946; M.A., Cambridge, 1950; Ph.D., Cambridge, 1950. Instructor in Physics, Harvard University, 1950-52. Bell Telephone Laboratories, 1952-. Before coming to the Laboratories, Dr. Carrett's principal research was in the field of low-temperature physics. At the Laboratories he has been engaged in research and exploratory development on semiconductor surfaces and, for the past year, has supervised a group working in this field. He is the author of "Magnetic Cooling" (Harvard

University Press, 1954). Senior Scholar of Trinity College, Cambridge, 1945. Twisden Student of Trinity College, 1949. Fellow of Physical Society (London). Member of American Physical Society.

L. D. HANSEN, B.S., Montana State College, 1924; Western Electric Company, 1924-. Mr. Hansen joined the Equipment Engineering Organization at the Hawthorne Plant of The Western Electric Company in Chicago in 1924 where he was engaged in preparation of telephone central office specifications. He transferred to the Kearny, N. J., Plant in 1928 where he was promoted to section chief in 1929. He transferred to the Engineer of Manufacture Organization in 1930 and worked on carrier and repeater test development and methods until 1941 when he was promoted to Department Chief in charge of wired switching apparatus and equipment test set development and methods.

WILLIAM C. JAKES, JR., B.S.E.E., Northwestern University, 1944; M.S., Northwestern, 1947; Ph.D., Northwestern, 1948. Bell Telephone Laboratories, 1949-. Dr. Jakes is engaged in microwave antenna and propagation studies and holds a patent in microwave antennas. He is the author of chapter in antenna engineering handbook (McGraw-Hill). Member of Sigma Xi, Pi Mu Epsilon, Eta Kappa Nu, I.R.E. and Phi Delta Theta.

AMOS E. JOEL, JR., B.S., Massachusetts Institute of Technology, 1940; M.S., M.I.T., 1942; Bell Telephone Laboratories, 1940-. Mr. Joel is Switching Systems Development Engineer responsible for coordinating the exploratory development of a trial electronic switching system. Prior to his present position he worked on relay engineering, crossbar test laboratory, fundamental development studies, circuits for relay computers, preparation of a text and teaching switching design, designing AMA computer circuits and making fundamental engineering studies on new switching systems. He holds some forty patents. Member of A.I.E.E., I.R.E., Sigma Xi and Association for Computing Machinery.

ARCHIE P. KING, B.S., California Institute of Technology, 1927. After three years with the Seismological Laboratory of the Carnegie Institution of Washington, Mr. King joined Bell Telephone Laboratories in 1930. Since then he has been engaged in ultra-high-frequency radio research at the Holmdel Laboratory, particularly with waveguides. For the last ten years Mr. King has concentrated his efforts on waveguide transmission and waveguide transducers and components for low-loss circular

electric wave transmission. He holds at least a score of patents in the waveguide field. Mr. King was cited by the Navy for his World War II radar contributions. He is a Senior Member of the I.R.E. and is a Member of the American Physical Society.

D. T. ROBB, B.S., University of Chicago, 1927; Western Electric Company, 1927-. Mr. Robb has been concerned with measurement and testing problems throughout his career. In the electrical laboratory at Hawthorne Works, Chicago, he specialized in ac standardization. Later he worked on the development of shop test methods and test sets. In 1944 he transferred to take charge of radar test engineering at the Eleventh Avenue Plant of Western Electric in New York City. In 1946 he supervised the engineering of the standards laboratory at Cbatham Road Plant in Winston Salem, N. C. Currently, he has charge of transmission test set development and test set design at Kearny Works, N. J.

HARRY R. SHILLINGTON, B.S. in E.E. Iowa State College, 1937; Long Lines Department of the American Telephone and Telegraph Company, 1928-1932; Western Electric Company, 1937-. Mr. Shillington's first assignment was that of product engineering on panel dial equipment. During World War II and the Korean War he was engaged in test engineering on various defense projects. He is presently concerned with the development of special test facilities for telephone apparatus. Member of Eta Kappa Nu and Tau Beta Pi.

FRIEDOLF M. SMITS, Dipl.Phys. and Dr.Rer.Nat., University of Freiburg, Germany, 1950; research assistant, Physikalisches Institut, University of Freiburg, 1950-54; Bell Telephone Laboratories, 1954-. As a member of the Solid State Electronics Research Department of the Laboratories, Dr. Smits has been concerned with diffusion studies of germanium and silicon for semiconductor device applications. He is a member of the American Physical Society and the German Physical Society.

FRANK H. TENDICK, JR., B.S.E.E., 1951, University of Michigan; Bell Telephone Laboratories, 1951-. Mr. Tendick was first engaged in work pertaining to the synthesis of networks employed in the L3 coaxial cable system. Later he engaged in the design of transistor networks for digital computers. More recently, he has been associated with exploratory studies of submarine cable systems. He is a member of the I.R.E. Mr.

Tendick also belongs to four honor societies, Tau Beta Pi, Eta Kappa Nu, Sigma Xi and Phi Kappa Phi.

LEISHMAN R. WRATHALL, B.S., 1927, University of Utah. Mr. Wrathall did another year of graduate work at the University of Utah and joined Bell Telephone Laboratories in 1929. For many years he was primarily concerned with studies of the characteristics of non-linear coils and capacitors. During World War II non-linear coils were used extensively in radar systems, and his work in this field was intensified. Later he was occupied with general circuit research. He is now engaged in studies of conductor problems, particularly digital repeaters, as a member of the Transmission Research Department at Murray Hill.

